	Division of Environmental Health and Communicable Disease Prevention	
	<b>Section: 4.0 Diseases and Conditions</b>	Updated 7/03
	Subsection: Ehrlichiosis	Page 1 of 10


## Ehrlichiosis Table of Contents

[Ehrlichiosis](#)

[Fact Sheet](#)

[CDC Lab Form \(50.34\)](#)

[Tick-Borne Rickettsial Disease Case Report \(MO580-2602\)](#)

	Division of Environmental Health and Communicable Disease Prevention	
	Section: 4.0 Diseases and Conditions	Updated 7/03
	Subsection: Ehrlichiosis	Page 2 of 10

## Ehrlichiosis

### **Overview** <sup>(1, 2)</sup>

For a complete description of ehrlichiosis, refer to the following texts:

- Control of Communicable Diseases Manual (CCDM).
- Red Book, Report of the Committee on Infectious Diseases.

### **Case Definition** <sup>(3)</sup>

#### ***Clinical description***

A tick-borne illness characterized by acute onset of fever, headache, myalgia, and/or malaise. Nausea, vomiting, or rash may be present in some cases. Clinical laboratory findings may include thrombocytopenia, leukopenia, and/or elevated liver enzymes. Intracytoplasmic bacterial aggregates (morulae) may be visible in the leukocytes of some patients.

Three categories of confirmed or probable ehrlichiosis should be reported: 1) human ehrlichiosis caused by *Ehrlichia chaffeensis* (HME), 2) human ehrlichiosis caused by *E. phagocytophila* (HGE), and 3) human ehrlichiosis (other or unspecified agent), which includes cases that cannot be easily classified by available laboratory techniques, and cases caused by novel *Ehrlichia* species such as *E. ewingii*.


#### ***Laboratory criteria for diagnosis***

##### HME:

- Demonstration of a four-fold change in antibody titer to *E. chaffeensis* antigen by indirect immunofluorescence assay (IFA) in paired serum samples, or
- Positive polymerase chain reaction (PCR) assay and confirmation of *E. chaffeensis* DNA, or
- Identification of morulae in leukocytes, and a positive IFA titer to *E. chaffeensis* antigen (based on cutoff titers established by the laboratory performing the assay), or
- Immunostaining of *E. chaffeensis* antigen in a biopsy or autopsy sample, or
- Culture of *E. chaffeensis* from a clinical specimen.

##### HGE:

- Demonstration of a four-fold change in antibody titer to *E. phagocytophila* antigen by IFA in paired serum samples, or
- Positive PCR assay and confirmation of *E. phagocytophila* DNA, or
- Identification of morulae in leukocytes, and a positive IFA titer to *E. phagocytophila* antigen (based on cutoff titers established by the laboratory performing the assay), or
- Immunostaining of *E. phagocytophila* antigen in a biopsy or autopsy sample, or
- Culture of *E. phagocytophila* from a clinical specimen.

	Division of Environmental Health and Communicable Disease Prevention	
	Section: 4.0 Diseases and Conditions	Updated 7/03
	Subsection: Ehrlichiosis	Page 3 of 10

Ehrlichiosis, human, other or unspecified agent:

- Demonstration of a four-fold change in antibody titer to more than one *Ehrlichia* species by IFA in paired serum samples, in which a dominant reactivity cannot be established, or
- Identification of an *Ehrlichia* species other than *E. chaffeensis* or *E. phagocytophila* by PCR, immunostaining, or culture.

***Case classification***

*Confirmed:* a clinically compatible illness that is laboratory-confirmed.

*Probable:* a clinically compatible illness with either a single positive IFA titer  $\geq 64$  or the visualization of morulae in leukocytes.

**NOTE:** *E. ewingii*, previously found in dogs, has been reported in humans in Missouri. The HME caused by *E. ewingii* responds to standard therapy for ehrlichia, but is not consistently detected by PCR. The laboratory method currently used for the detection of *E. ewingii* is a research tool. <sup>(4)</sup>

**Information Needed for Investigation**

**Verify the diagnosis.** Determine what laboratory tests were conducted and the results.

**Establish the extent of illness.** Determine if household or other close contacts are, or have been, ill by contacting the health care provider, patient or family member.

**Case/Contact Follow Up And Control Measures**

Ehrlichiosis is not spread person-to-person. However, shared outdoor activities should be investigated for cases among families and friends.

**Control Measures**


See the Control of Communicable Diseases Manual, Ehrlichiosis, “Methods of control.”

See the Red Book, Ehrlichiosis, “Control Measures.”

**Laboratory Procedures**

**Specimens:**

- The Missouri State Public Health Laboratory (SPHL) does not test for rickettsial diseases. However, paired serum specimens can be sent through the SPHL to the Centers for Disease Control and Prevention for testing. Acute and convalescent serum specimens three or more weeks apart should be collected.
- Acute blood specimens can be collected and whole blood sent to the SPHL accompanied by CDC form 50.34. The SPHL will hold the blood and send a reminder letter for the convalescent specimen.
- Acute blood can be collected, centrifuged and the serum removed and frozen until the convalescent blood is collected. Both acute and convalescent sera should be sent to the SPHL accompanied by CDC form 50.34 for forwarding to CDC for testing.

	Division of Environmental Health and Communicable Disease Prevention	
	Section: 4.0 Diseases and Conditions	Updated 7/03
	Subsection: Ehrlichiosis	Page 4 of 10

- HME caused by *E. chaffeensis* is the dominant form of ehrlichiosis in Missouri. **The submitter must specify if they are requesting the test for HME or HGE since they require different antigens.**
- Additional information on laboratory procedures can be obtained from the Regional Communicable Disease Coordinator or from staff at the SPHL. The SPHL telephone number is 573-751-0633 and the web site is: <http://www.dhss.state.mo.us/Lab/index.htm>. (4 June 2003)
- Laboratory testing for *E. chaffeensis* is also widely available through many private commercial reference laboratories.


### **Reporting Requirements**

Ehrlichiosis is a Category II disease and shall be reported to the local health authority or to the Missouri Department of Health and Senior Services (DHSS) within three days of first knowledge or suspicion by telephone, facsimile or other rapid communication.

1. For all cases, complete a "Disease Case Report" (CD-1).
2. For all cases, complete a "Tick-Borne Rickettsial Disease Case Report" (MO 580-2602, 3-03).
3. Entry of the completed CD-1 into MOHSIS negates the need for the paper CD-1 to be forwarded to the Regional Health Office.
4. Send the completed secondary investigation form to the Regional Health Office.
5. All outbreaks or "suspected" outbreaks must be reported as soon as possible (by phone, fax, or e-mail) to the Regional Communicable Disease Coordinator. This can be accomplished by completing the Missouri Outbreak Surveillance Report (CD-51)
6. Within 90 days of the conclusion of an outbreak, submit the final outbreak report to the Regional Communicable Disease Coordinator.

### **References**

1. Chin, James, ed. "Ehrlichiosis (Sennetsu fever, Human ehrlichiosis found in the USA)." Control of Communicable Diseases Manual. 17<sup>th</sup> ed. Washington, DC: American Public Health Association, 2000: 181-183.
2. American Academy of Pediatrics. "Ehrlichiosis (Human)." In: Pickering, LK, ed. 2000 Red Book: Report of the Committee on Infectious Diseases. 25<sup>th</sup> ed. Elk Grove Village, IL. 2000: 234-236.
3. Centers for Disease Control and Prevention. Case Definitions for Infectious Conditions Under Public Health Surveillance. MMWR 1997: 46 (No. RR-10). "Ehrlichiosis," 2000, [http://www.cdc.gov/epo/dphsi/casedef/ehrlichiosis\\_current.htm](http://www.cdc.gov/epo/dphsi/casedef/ehrlichiosis_current.htm) (4 June 2003)
4. Buller, RS, Arens, M, Hmiel, SP, Paddock, CD, et al. "*Ehrlichia Ewingii*, A Newly Recognized Agent of Human Ehrlichiosis." New England Journal of Medicine. 1999: 341: 148-155.

	Division of Environmental Health and Communicable Disease Prevention	
	<b>Section: 4.0 Diseases and Conditions</b>	Updated 7/03
	Subsection: Ehrlichiosis	Page 5 of 10

### **Other Sources of Information**

1. Saah, Alfred J. "Ehrlichia Species (Human Ehrlichiosis)." Principles and Practice of Infectious Diseases. 3<sup>rd</sup> ed. Eds. Gerald L. Mandell, R. Gordon Douglas, and John E. Bennett. New York: Churchill Livingstone, 1990: 1482-1483.
2. McDade, J. E. "A Disease of Animals and Humans." Journal of Infectious Diseases. April 1990, 609-617.
3. The Merck Veterinary Manual. 8<sup>th</sup> Ed. Ed. Susan E. Aiello. Whitehouse Station, NJ: Merck & Co., Inc., 1998. <http://www.merckvetmanual.com/mvm/index.jsp> (search "ehrlichia"). (4 June 2003)

### **Web Resources and Information**

David H. Walker and J. S. Dumler. "Emergence of the Ehrlichiosis as Human Health Problems." Emergence of the Ehrlichiosis as Human Health Problems. January-March 1996, <http://www.cdc.gov/ncidod/EID/vol2no1/walker1.htm> (4 June 2003).

# **Ehrlichiosis**

## **FACT SHEET**

### **What is ehrlichiosis?**

Ehrlichiosis in humans in the United States is a relatively uncommon tick-borne illness caused by rickettsial organisms such as *E. chaffeensis*. CDC records show that from 1986 through 1997 only 800 cases of serologically-confirmed *E. chaffeensis* infection were diagnosed in the United States.

### **Who gets ehrlichiosis?**

Anyone can get ehrlichiosis, although the majority of known cases have been in adults. People who spend time outdoors, in tick-infested areas from March until October are at greatest risk for exposure.

### **How is ehrlichiosis transmitted?**

Ehrlichiosis is spread by a variety of ticks. Human monocytic ehrlichiosis (HME) is transmitted by the *Amblyomma americanum* (the Lone Star tick), *Dermacentor variabilis* (the American dog tick), and the deer tick. Human granulocytic ehrlichiosis (HGE) is suspected of being transmitted by either the *Ixodes scapularis* or *Ixodes Pacificus* tick.

### **What is the incubation period of ehrlichiosis**

The average incubation period from tick bite to illness is 5 to 10 days, with a range of 7-21 days.

### **What are the symptoms of ehrlichiosis?**

The early clinical presentations of ehrlichiosis may resemble nonspecific signs and symptoms of various other infectious and non-infectious diseases. Initial symptoms generally include fever, headache, malaise, and muscle aches. Other signs and symptoms may include nausea, vomiting, diarrhea, cough, joint pains, confusion, and occasionally rash. In contrast to Rocky Mountain spotted fever, rash is relatively uncommon in adult patients with HME, and is rarely reported with HGE. However, rash has been described in approximately 60% of pediatric patients infected with *E. chaffeensis*.

### **How long does the disease last?**

Typically, the disease lasts from 1 to 2 weeks and recovery occurs without long-lasting problems. However complications can occur and include respiratory problems, blood and kidney abnormalities, meningitis, and other central nervous system complications. Occasionally, these complications may be life-threatening or even fatal.

### **What is the treatment for ehrlichiosis?**

Tetracycline antibiotics are effective therapies for ehrlichiosis. These antibiotics can cause dental staining in children. Rifampin currently is being evaluated as a possible alternative treatment for children.

## **How can ehrlichiosis be prevented?**

1. Avoid tick-infested areas, especially during the warmer months.
2. Wear light colored clothing so ticks can be easily seen and removed. Wear a long sleeved shirt, hat, long pants, and tuck your pant legs into your socks.
3. Walk in the center of trails to avoid overhanging grass and brush.
4. Check your body every few hours for ticks when you spend a lot of time outdoors in tick-infested areas. Ticks are most often found on the thigh, arms, underarms, and legs or where tight fitting clothing has been.
5. Use insect repellents containing DEET on your skin or permethrin on clothing. Permethrin should only be used on clothing. Be sure to follow the directions on the container and wash off repellents when going indoors. Carefully read the manufacturer's label on repellents before using on children.
6. Remove attached ticks immediately.

## **How should a tick be removed?**

Ticks should be removed promptly and carefully by using tweezers and applying gentle, steady traction. Do not crush the tick's body when removing it and apply the tweezers as close to the skin as possible to avoid leaving tick mouthparts in the skin. Do not remove ticks with your bare hands. Protect your hands with gloves, cloth, or tissue and be sure to wash your hands after removing a tick. After removing the tick, disinfect the skin with soap and water or other available disinfectants.

**Missouri Department of Health and Senior Services  
Section for Communicable Disease Prevention  
Phone: (866) 628-9891 or (573) 751-6113**

<b>LABORATORY EXAMINATION(S) REQUESTED:</b> <input type="checkbox"/> <b>AN</b> timicrobial Susceptibility <input type="checkbox"/> <b>I</b> solation <input type="checkbox"/> <b>H</b> istology <input type="checkbox"/> <b>SE</b> rology (Specific Test) _____ <input type="checkbox"/> <b>ID</b> entification <input type="checkbox"/> <b>OT</b> her (Specify) _____				<b>CATEGORY OF AGENT SUSPECTED:</b> <input type="checkbox"/> <b>B</b> acterial <input type="checkbox"/> <b>R</b> ickettsial <input type="checkbox"/> <b>V</b> iral <input type="checkbox"/> <b>P</b> arasitic <input type="checkbox"/> <b>F</b> ungal <input type="checkbox"/> <b>OT</b> her (Specify) _____													
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<b>EPIDEMIOLOGICAL DATA:</b> <input type="checkbox"/> <b>S</b> ingle Case <input type="checkbox"/> <b>SP</b> oradic <input type="checkbox"/> <b>CO</b> ntact <input type="checkbox"/> <b>EP</b> idemic <input type="checkbox"/> <b>CA</b> rrier Family Illness _____ Community Illness _____ <b>Travel and Residence (Location)</b> <input type="checkbox"/> <b>FO</b> reign _____ <input type="checkbox"/> <b>USA</b> _____ Animal Contacts (Species) _____ Anthropol Contacts: <input type="checkbox"/> None <input type="checkbox"/> Exposuer Only <input type="checkbox"/> Bite Type of Anthropol: _____ Suspected Source of Infection: _____						<b>GASTROINTESTINAL:</b> <input type="checkbox"/> <b>D</b> iarrhea <input type="checkbox"/> <b>BL</b> ood <input type="checkbox"/> <b>MU</b> cous <input type="checkbox"/> <b>CO</b> nstipation <input type="checkbox"/> <b>AB</b> normal Pain <input type="checkbox"/> <b>VO</b> miting <input type="checkbox"/> <b>OT</b> her _____						<b>STATE OF ILLNESS:</b> <input type="checkbox"/> <b>SY</b> mptomatic <input type="checkbox"/> <b>AS</b> ymptomatic <input type="checkbox"/> <b>SU</b> bacute <input type="checkbox"/> <b>CH</b> ronic <input type="checkbox"/> <b>DI</b> sseminated <input type="checkbox"/> <b>LO</b> calized <input type="checkbox"/> <b>EX</b> traintestinal <input type="checkbox"/> <b>OT</b> her _____					
<b>PREVIOUS LABORATORY RESULTS/OTHER CLINICAL INFORMATION:</b> (Information supplied should be related to this case and/or specimen(s) and relative to the test(s) requested.																	

*Justification must be completed by State health department laboratory before specimen can be accepted by CDC. Please check the first applicable statement and when appropriate complete the statement with the \*.*

1. Disease suspected to be of public health importance. Specimen is:  
 (a) ☐ from an outbreak. (b) ☐ from uncommon or exotic disease.  
 (c) ☐ an isolate that cannot be identified, is atypical, shows multiple antibiotic resistance, or from a normally sterile site(s) (d) ☐ from a disease for which reliable diagnostic reagents or expertise are unavailable in State.

2. ☐ Ongoing collaborative CDC/State project.

3. ☐ Confirmation of results requested for quality assurance.

\*Prior arrangement for testing has been made.  
 Please bring to the attention of:  
 (Name): \_\_\_\_\_

Completed by: \_\_\_\_\_  
 Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Name, Address and Phone Number of Physician or Organization: \_\_\_\_\_

**STATE HEALTH DEPARTMENT LABORATORY ADDRESS:** \_\_\_\_\_

**STATE HEALTH DEPT. NO.:** \_\_\_\_\_ **DATE SENT TO CDC:** (MM/DD/YYYY) \_\_\_\_/\_\_\_\_/\_\_\_\_

**PATIENT IDENTIFICATION:** (Hospital No.) \_\_\_\_\_

**NAME:** (LAST, FIRST, MI) \_\_\_\_\_

**BIRTHDATE:** (MM/DD/YYYY) \_\_\_\_/\_\_\_\_/\_\_\_\_ **SEX:** ☐ MALE ☐ FEMALE

**CLINICAL DIAGNOSIS:** \_\_\_\_\_

**ASSOCIATED ILLNESS:** \_\_\_\_\_

**DATE OF ONSET:** (MM/DD/YYYY) \_\_\_\_/\_\_\_\_/\_\_\_\_ **FATAL?** ☐ YES ☐ NO

(FOR CDC USE ONLY)		CDC NUMBER		DATE RECEIVED
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REVERSE SIDE OF THIS FORM MUST BE COMPLETED

THIS FORM MUST BE EITHER PRINTED OR TYPED  
 PLEASE PREPARE A SEPARATE FORM FOR EACH SPECIMEN

D.A.S.H.

DATE REPORTED

MO DA YR

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Comments: \_\_\_\_\_

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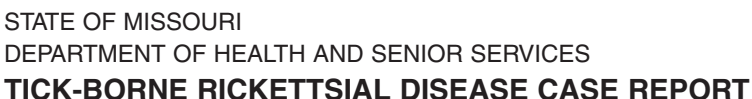
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DEPARTMENT OF HEALTH AND HUMAN SERVICES  
 Public Health Service  
 Centers for Disease Control  
 Center for Infectious Diseases  
 Atlanta, Georgia 30333



The Centers for Disease Control (CDC), an agency of the Department of Health and Human Services, is authorized to collect this information, including the Social Security number (if applicable), under provisions of the Public Health Service Act, Section 301 (42 U.S.C. 241). Supplying the information is voluntary and there is no penalty for not providing it. The data will be used to increase understanding of disease patterns, develop prevention and control programs, and communicate new knowledge to the health community. Data will become part of CDC Privacy Act system 09-20-0106, "Specimen Handling for Testing and Related Data" and may be disclosed: to appropriate State or local public health departments and cooperating medical authorities to deal with conditions of public health significance; to private contractors assisting CDC in analyzing and refining records; to researchers under certain limited circumstances to conduct further investigations; to organizations to carry out audits and reviews on behalf of HHS; to the Department of Justice in the event of litigation, and to a congressional office assisting individuals in obtaining their records. An accounting of the disclosures that have been made by CDC will be made available to the subject individual upon request. Except for permissible disclosures expressly authorized by the Privacy Act, no other disclosure may be made without the subject individual's written consent.



CDC NO. (1-4)	MOHSIS ID NUMBER

**Use for:** Rocky Mountain spotted fever (RMSF), ehrlichiosis (human monocytic ehrlichiosis [HME], and human granulocytic ehrlichiosis [HGE]).

## PATIENT/PHYSICIAN INFORMATION

PATIENT'S NAME	DATE SUBMITTED (5-12)
	____/____/____ MM/DD/YY

ADDRESS (NUMBER, STREET)	CITY
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PHYSICIAN'S NAME	PHYSICIAN TELEPHONE NUMBER	NETSS ID NUMBER (IF REPORTED) (13-23) <div> <div> <div></div><div></div><div></div><div></div><div></div><div></div><div></div> </div> <div>—</div> <div> <div></div><div></div><div></div> </div> <div>—</div> <div> <div></div><div></div> </div> </div> <div> <div>CASE ID</div> <div>SITE</div> <div>STATE</div> </div>
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## DEMOGRAPHICS

<b>1. STATE OF RESIDENCE (24-25)</b>  Postal Abv. <span style="border: 1px solid black; display: inline-block; width: 30px; height: 20px; vertical-align: middle;"></span>	<b>2. COUNTY OF RESIDENCE (26-50)</b>  <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>
<b>3. ZIP CODE (51-59)</b>  <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="margin: 0 5px;">—</div> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px;"></div> </div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>

4. SEX (60)	5. DATE OF BIRTH (61-68)	6. RACE (69)	7. HISPANIC ETHNICITY (70)
1 <input type="checkbox"/> MALE    2 <input type="checkbox"/> FEMALE	____ / ____ / ____    MM/DD/YY	1 <input type="checkbox"/> WHITE    3 <input type="checkbox"/> AMERICAN INDIAN/ALASKAN NATIVE    9 <input type="checkbox"/> NOT SPECIFIED 2 <input type="checkbox"/> BLACK    4 <input type="checkbox"/> ASIAN    5 <input type="checkbox"/> PACIFIC ISLANDER	1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO

8. INDICATE DISEASE TO BE REPORTED (71)

1 ☐ RMSF      2 ☐ HME      3 ☐ HGE      4 ☐ EHRLICHIOSIS (UNSPECIFIED, OR OTHER AGENT)

## CLINICAL SIGNS, SYMPTOMS, AND OUTCOMES

9. SYMPTOMS (72)				MALAISE	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK	VOMITING	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK
ANEMIA				1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK	MYALGIA	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK	THROMBOCYTOPENIA
FEVER > 100				1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK	NAUSEA	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK	LEUKOPENIA
HEADACHE				1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK	RASH	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK	ELEVATED LIVER ENZYMES

10. DATE OF ONSET OF SYMPTOMS (73-80) ____ / ____ / ____ MM/DD/YYYY	11. WAS AN UNDERLYING IMMUNOSUPPRESSIVE CONDITION PRESENT? (81) 1 <input type="checkbox"/> YES   2 <input type="checkbox"/> NO   9 <input type="checkbox"/> UNK   SPECIFY CONDITION(S):
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12. SPECIFY ANY LIFE-THREATENING COMPLICATIONS IN THE CLINICAL COURSE OF ILLNESS (82)

1 <input type="checkbox"/> ADULT RESPIRATORY DISTRESS SYNDROME (ARDS)	3 <input type="checkbox"/> MENINGITIS/ENCEPHALITIS	8 <input type="checkbox"/> OTHER: _____
2 <input type="checkbox"/> DISSEMINATED INTRAVASCULAR COAGULOPATHY (DIC)	4 <input type="checkbox"/> RENAL FAILURE	9 <input type="checkbox"/> NONE

13. WAS THE PATIENT HOSPITALIZED BECAUSE OF THIS ILLNESS? (83)  
1 ☐ YES 2 ☐ NO 9 ☐ UNK (IF YES, DATE) (84-91) \_\_\_\_ / \_\_\_\_ / \_\_\_\_

14. DID THE PATIENT DIE BECAUSE OF THIS ILLNESS? (92)  
1 ☐ YES 2 ☐ NO 9 ☐ UNK (IF YES, DATE) (93-100) \_\_\_\_ / \_\_\_\_ / \_\_\_\_

## LABORATORY DATA

15. NAME OF LABORATORY	CITY	STATE	ZIP CODE <div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> — <div> <div></div> <div></div> <div></div> <div></div> </div>
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Below, indicate Y (yes) or N (no) ONLY if the test or procedure was performed. LACK OF SELECTION indicates that the test or procedure was not performed.

16. SEROLOGIC TESTS	SEROLOGY 1 COLLECTION DATE (101-108) ____ / ____ / ____ MM/DD/YYYY		SEROLOGY 2* COLLECTION DATE (109-116) ____ / ____ / ____ MM/DD/YYYY		17. OTHER DIAGNOSTIC TESTS?	POSITIVE?
	TITER	POSITIVE?	TITER	POSITIVE?		
IFA-IgG		1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (117)		1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (118)	Morulae visualization*	1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (134)
IFA-IgM		1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (119)		1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (120)	Immunostain	1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (135)
OTHER TEST (121-130)		1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (131)		1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (132)	Culture	1 <input type="checkbox"/> YES 2 <input type="checkbox"/> NO (136)

\* WAS THERE A FOURFOLD CHANGE IN ANTIBODY TITER BETWEEN THE TWO SERUM SPECIMENS? (137)

1 ☐ YES    2 ☐ NO

\* Visualization of morulae not applicable for RMSE.

## EPIDEMIOLOGICAL FEATURES

18. TICK EXPOSURE

1. TICK BITE OR ATTACHMENT WITHIN 21 DAYS OF ONSET?	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK
2. IF NO TICK BITE OR ATTACHMENT, WAS PATIENT IN A KNOWN TICK INFESTED AREA WITHIN LAST 21 DAYS?	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK
3. DID ANY OTHER FAMILY MEMBER HAVE A SIMILAR ILLNESS THIS YEAR?	1 <input type="checkbox"/> YES	2 <input type="checkbox"/> NO	9 <input type="checkbox"/> UNK

IF YES TO QUESTION 1 OR 2, WHERE? (STATE, COUNTY)

## FINAL DIAGNOSIS

19. CLASSIFY CASE BASED ON THE CDC CASE DEFINITION (138-148) (149)

1 ☐ RMSF 2 ☐ HME 3 ☐ HGE 4 ☐ EHRLICHIOSIS (unspecified, or other agent) 1 ☐ **CONFIRMED** 2 ☐ **PROBABLE**

## STATE HEALTH DEPARTMENT OFFICIAL WHO REVIEWED THIS REPORT

NAME	TITLE	DATE (MM/DD/YYYY) ____ / ____ / ____
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OTHER PERTINENT EPIDEMIOLOGICAL DATA (TO INCLUDE PROBABLE SOURCE)